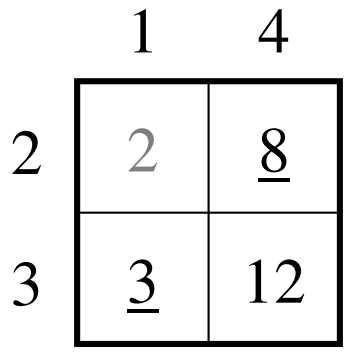
MAXIMUM MATH
From the Multiplication Table



$$^{2}/_{3} + {}^{1}/_{4} = {}^{11}/_{12}$$

By Brad Fulton
California League of Middle Schools
Educator of the Year, 2005
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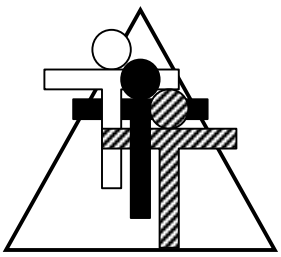

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Brad Fulton and Bill Lombard
Teacher to Teacher Press
"Building Mathematical Skill on a Foundation of Understanding"

Brad Fulton

- **Consultants**
- **Educators**
- **Authors**
- **Seminar leaders**
- **Teacher trainers**
- **Conference speakers**

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Known throughout the country for motivating and engaging teachers and students, Brad and Bill have authored over ten books that provide easy-to-teach yet mathematically-rich activities for busy teachers. In addition, they have co-authored six teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leaders and trainers of mathematics teachers

- California Math Council and NCTM presenters
- Lead trainers for summer teacher training institutes
- Trainers/consultants for district, county, regional, and national workshops

Authors and co-authors of mathematics curriculum

- *Simply Great Math Activities* series: five books covering all major strands
- *Math Discoveries* series: bringing math alive for students in middle schools
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All workshops provide participants with complete and ready-to-use activities. These activities require minimal preparation, use materials commonly found in classrooms, and give clear and specific directions and format. Participants will also receive journal prompts, homework suggestions, and ideas for extensions and assessment.

Brad and Bill's math activities are the best I've seen in 30 years of teaching!
Wayne Dequer, 7th grade math teacher

"The high-energy, easy-to-follow handouts were clear. The instructors were great!"
DeLinda Van Dyke, middle school teacher

References available upon request

With a Multiplication Table You Can:

- ✓ Simplify fractions
- ✓ Find equivalent fractions
- ✓ Add and subtract fractions of unlike denominators
- ✓ Multiply fractions
- ✓ Divide fractions
- ✓ Help students understand fraction procedures better
- ✓ Solve proportions
- ✓ Explore algebraic proofs
- ✓ Explore quadratic functions

(Oh yes, you can also

multiply numbers!)

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Simplifying fractions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4			12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7			21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Simplify $^{12}/_{21}$

Find your fraction vertically in the multiplication table.

Read its simplified value from the left-hand column.

Answer: $^{4}/_{7}$

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3						18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5						30	35	40	45	50
6			18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10			30	40	50	60	70	80	90	100

When looking for your fraction in the table, you may find it more than once. Use the uppermost location to find the simplest form.

Example: Simplify $^{18}/_{30}$

Answer: $^{3}/_{5}$

Simplifying Fractions
Practice Page

Name_____

Date _____Period _____

Simplify the following fractions using your multiplication table.

1) $\frac{3}{6}$=_____

2) $\frac{5}{15}$=_____

3) $\frac{3}{9}$=_____

4) $\frac{10}{25}$=_____

5) $\frac{14}{21}$=_____

6) $\frac{60}{70}$=_____

7) $\frac{10}{12}$=_____

8) $\frac{3}{9}$=_____

9) $\frac{28}{35}$=_____

10) $\frac{4}{16}$=_____

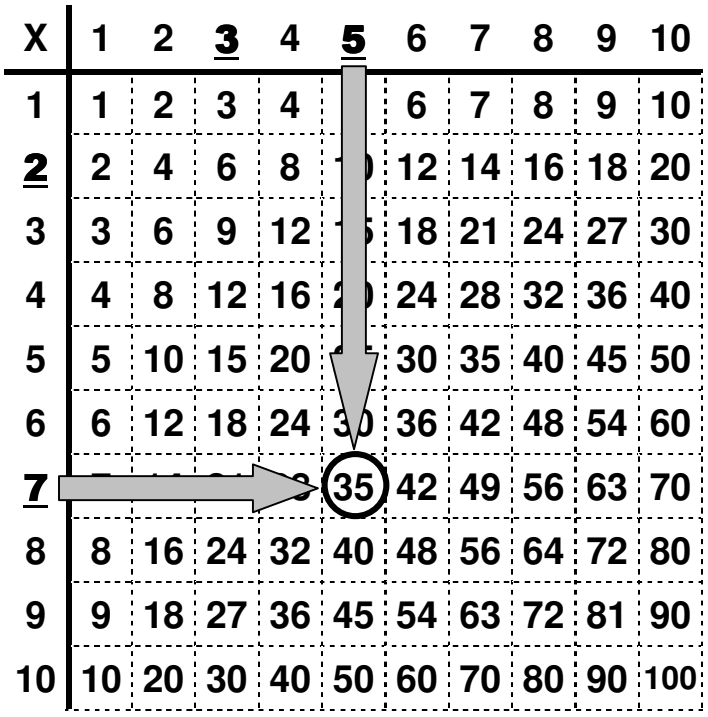
11) $\frac{12}{18}$=_____

12) $\frac{20}{24}$=_____

13) $\frac{24}{30}$=_____

14) $\frac{18}{36}$=_____

Adding and Subtracting
Of Unlike Denominators:



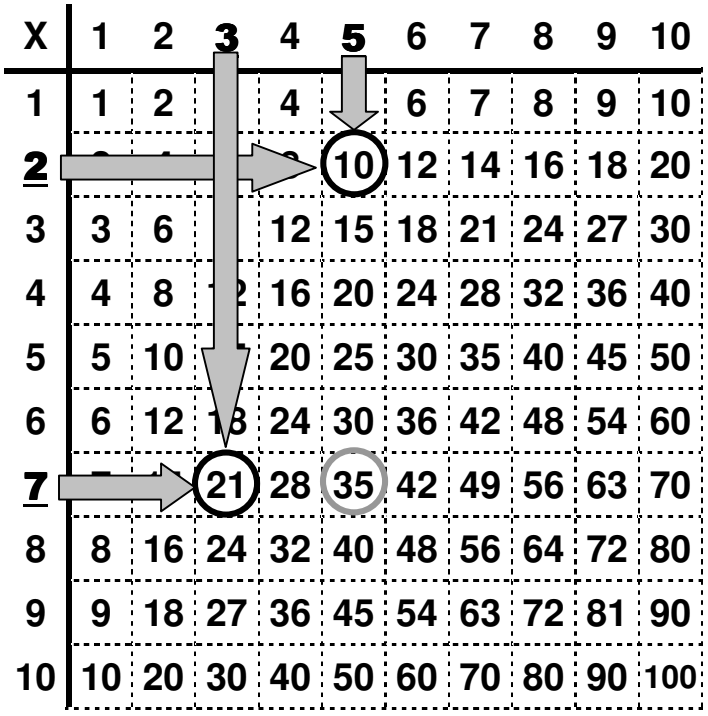
X	1	2	**3**	4	**5**	6	7	8	9	10
1	1	2	3	4		6	7	8	9	10
2	2	4	6	8		12	14	16	18	20
3	3	6	9	12		18	21	24	27	30
4	4	8	12	16		24	28	32	36	40
5	5	10	15	20		30	35	40	45	50
6	6	12	18	24		36	42	48	54	60
7					35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Add $^{2}/_{7} + {}^{3}/_{5}$

Find the first fraction on the left of the table.

Find the second fraction at the top of the table.

Multiply the denominators as shown. This is the denominator of your answer.

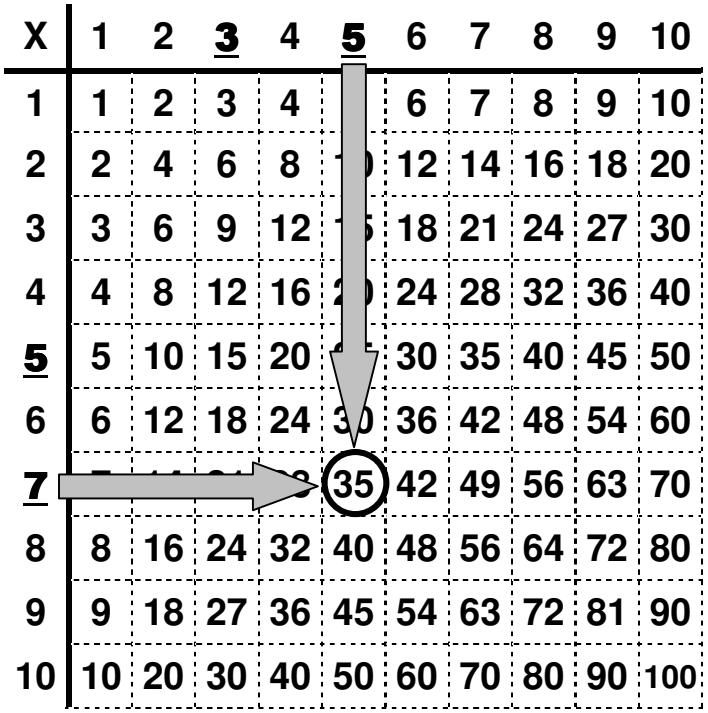


X	1	2	**3**	4	**5**	6	7	8	9	10
1	1	2		4		6	7	8	9	10
2					10	12	14	16	18	20
3	3	6		12	15	18	21	24	27	30
4	4	8		16	20	24	28	32	36	40
5	5	10		20	25	30	35	40	45	50
6	6	12		24	30	36	42	48	54	60
7			21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Multiply as shown and add the products. This is the numerator of your answer.

Answer: $^{31}/_{35}$

Simplify if necessary.



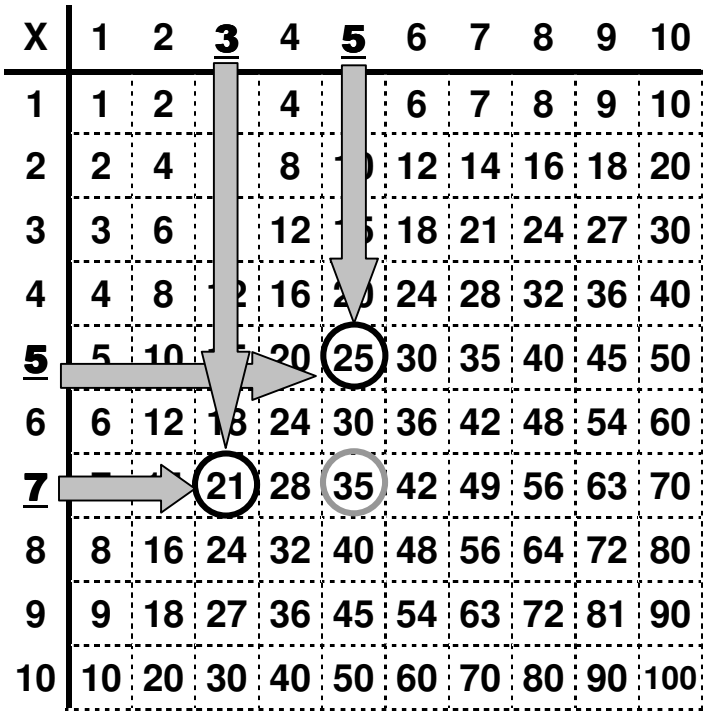
X	1	2	**3**	4	**5**	6	7	8	9	10
1	1	2	3	4		6	7	8	9	10
2	2	4	6	8		12	14	16	18	20
3	3	6	9	12		18	21	24	27	30
4	4	8	12	16		24	28	32	36	40
5	5	10	15	20		30	35	40	45	50
6	6	12	18	24		36	42	48	54	60
7					35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Subtract $^{5}/_{7} - {}^{3}/_{5}$

Find the first fraction on the left of the table.

Find the second fraction at the top of the table.

Multiply the denominators as shown. This is the denominator of your answer.



X	1	2	**3**	4	**5**	6	7	8	9	10
1	1	2		4		6	7	8	9	10
2	2	4		8		12	14	16	18	20
3	3	6		12		18	21	24	27	30
4	4	8		16		24	28	32	36	40
5					25	30	35	40	45	50
6	6	12		24	30	36	42	48	54	60
7			21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Multiply as shown and subtract the products. This is the numerator of your answer.

Answer: $^{4}/_{35}$

Simplify if necessary.

Adding Fractions
Practice Page

Name_____

Date _____Period _____

Add the following fractions using your multiplication table. Simplify as necessary.

1) $\frac{1}{2}+\frac{1}{3}=$_____

2) $\frac{1}{4}+\frac{1}{5}=$_____

3) $\frac{1}{3}+\frac{1}{4}=$_____

4) $\frac{2}{3}+\frac{1}{5}=$_____

5) $\frac{3}{7}+\frac{1}{2}=$_____

6) $\frac{2}{5}+\frac{1}{3}=$_____

7) $\frac{1}{2}+\frac{1}{4}=$_____

8) $\frac{1}{6}+\frac{1}{4}=$_____

9) $\frac{1}{2}+\frac{2}{3}=$_____

10) $\frac{3}{5}+\frac{2}{3}=$_____

11) $\frac{3}{8}+\frac{1}{2}=$_____

12) $\frac{7}{8}+\frac{1}{4}=$_____

Subtracting Fractions
Practice Page

Name_____

Date _____Period _____

Subtract the following fractions using your multiplication table. Simplify as necessary.

1) $\frac{1}{2}-\frac{1}{3}=$_____

2) $\frac{1}{4}-\frac{1}{5}=$_____

3) $\frac{1}{3}-\frac{1}{4}=$_____

4) $\frac{2}{3}-\frac{1}{5}=$_____

5) $\frac{5}{7}+\frac{1}{2}=$_____

6) $\frac{2}{5}-\frac{1}{3}=$_____

7) $\frac{1}{2}-\frac{1}{4}=$_____

8) $\frac{5}{6}-\frac{1}{4}=$_____

9) $\frac{1}{2}-\frac{2}{9}=$_____

10) $\frac{3}{4}-\frac{2}{3}=$_____

11) $\frac{1}{2}-\frac{3}{8}=$_____

12) $\frac{7}{8}-\frac{1}{4}=$_____

Multiplying Fractions:

X	1	2	**3**	**4**	5	6	7	8	9	10
1	1	2			5	6	7	8	9	10
2	2	4			10	12	14	16	18	20
3	3	6			15	18	21	24	27	30
4			12		20	24	28	32	36	40
5				20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Multiply $^{4}/_{5}$ x $^{3}/_{4}$

Find the first fraction on the left of the table.

Find the second fraction at the top of the table.

Multiply as shown. The upper number is the numerator of your answer. The lower number is the denominator.

X	1	2	**3**	4	**5**	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3				12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5				20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Simplify if necessary.

Answer: $^{3}/_{5}$

Multiplying Fractions
Practice Page

Name_____

Date _____Period _____

Multiply the following fractions using your multiplication table.
Simplify as necessary.

1) $\frac{1}{2}\times\frac{1}{3}=$_____

2) $\frac{1}{4}\times\frac{1}{5}=$_____

3) $\frac{1}{3}\times\frac{1}{4}=$_____

4) $\frac{2}{3}\times\frac{1}{5}=$_____

5) $\frac{5}{7}\times\frac{1}{2}=$_____

6) $\frac{2}{5}\times\frac{1}{3}=$_____

7) $\frac{2}{3}\times\frac{1}{4}=$_____

8) $\frac{5}{6}\times\frac{3}{4}=$_____

9) $\frac{1}{2}\times\frac{2}{9}=$_____

10) $\frac{3}{4}\times\frac{2}{3}=$_____

11) $\frac{1}{6}\times\frac{3}{8}=$_____

12) $\frac{2}{9}\times\frac{3}{4}=$_____

Dividing Fractions:

X	1	2	**3**	**4**	5	6	7	8	9	10
1	1	2			5	6	7	8	9	10
2	2	4			10	12	14	16	18	20
3	3	6			15	18	21	24	27	30
4				16	20	24	28	32	36	40
5			15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Divide $^{4}/_{5} \div {}^{3}/_{4}$

Find the first fraction on the left of the table.

Find the second fraction at the top of the table.

Multiply as shown. The upper number is the numerator of your answer. The lower number is the denominator.

Result: $^{16}/_{15}$

Simplify if necessary.

Answer: $1^{1}/_{15}$

Dividing Fractions
Practice Page

Name_____

Date _____Period _____

Divide the following fractions using your multiplication table. Simplify as necessary.

1) $\frac{1}{3} \div \frac{1}{2} =$_____

2) $\frac{1}{5} \div \frac{1}{3} =$_____

3) $\frac{1}{3} \div \frac{3}{4} =$_____

4) $\frac{1}{7} \div \frac{2}{5} =$_____

5) $\frac{2}{5} \div \frac{3}{5} =$_____

6) $\frac{2}{5} \div \frac{2}{5} =$_____

7) $\frac{2}{3} \div \frac{1}{3} =$_____

8) $\frac{1}{6} \div \frac{5}{6} =$_____

9) $\frac{5}{8} \div \frac{3}{8} =$_____

10) $\frac{3}{4} \div \frac{2}{3} =$_____

11) $\frac{1}{6} \div \frac{3}{8} =$_____

12) $\frac{2}{9} \div \frac{3}{4} =$_____

Fraction Operations
Without a Multiplication Table:

Often students are not allowed to use a multiplication table during testing. Here is a simple way to show them to create a do-it-yourself template for solving all four operations:

Add $^2/_3 + {}^1/_4 =$

Subtract $^2/_3 - {}^1/_4 =$

Multiply $^2/_3 \times {}^1/_4 =$

Divide $^2/_3 \div {}^1/_4 =$

	1	4
2		
3		

Draw a two by two grid:

Write the first fraction on the left of the grid.

Write the second fraction on the top of the grid.

Multiply the digits to complete the grid.

	1	4
2	2	8
3	3	12

The sum is found by adding the 8 + 3 and writing the answer over the 12.
$^2/_3 + {}^1/_4 = {}^{11}/_{12}$

The difference is found by subtracting the 8 – 3 and writing the answer over the 12.
$^2/_3 - {}^1/_4 = {}^5/_{12}$

	1	4
2	2	<u>8</u>
3	<u>3</u>	12

The product is found in one of the diagonals as shown.
$^2/_3 \times {}^1/_4 = {}^2/_{12}$
Simplify as necessary. $^2/_{12} = {}^1/_6$

	1	4
2	<u>2</u>	8
3	3	<u>12</u>

The quotient is found in the other diagonal as shown.
$^2/_3 \div {}^1/_4 = {}^8/_3$
Simplify as necessary. $^8/_3 = 2\,{}^2/_3$

	1	4
2	2	<u>8</u>
3	<u>3</u>	12

Solving Proportions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Example: Solve $\frac{12}{30} = \frac{16}{x}$

Find the three known numbers as vertices of a rectangle.

The missing vertex is the solution to the proportion.

x = 40

Why this works:

Notice that the 12 is the product of 6 x 2.

The 16 is the product of 8 x 2.

The 30 is the product of the 6 x 5.

The proportion could be written:

$$\frac{(6 \times 2)}{(6 \times 5)} = \frac{(8 \times 2)}{x}$$

Using the cross products rule gives us:

(6 x 2)(x) = (6 x 5)(8 x 2)

The associative property gives us:

(6 x 2)(x) = (6 x 2)(8 x 5)

Canceling the common factors leaves:

x = (8 x 5) = 40

Solving Proportions
Practice Page

Name_____

Date _____Period _____

Solve the proportions using your multiplication table.

1) $\frac{9}{12}=\frac{15}{x}$

2) $\frac{20}{28}=\frac{35}{x}$

3) $\frac{8}{24}=\frac{x}{36}$

4) $\frac{10}{12}=\frac{x}{30}$

5) $\frac{9}{x}=\frac{1}{3}$

6) $\frac{12}{x}=\frac{10}{15}$

7) $\frac{x}{24}=\frac{15}{18}$

8) $\frac{x}{14}=\frac{35}{49}$

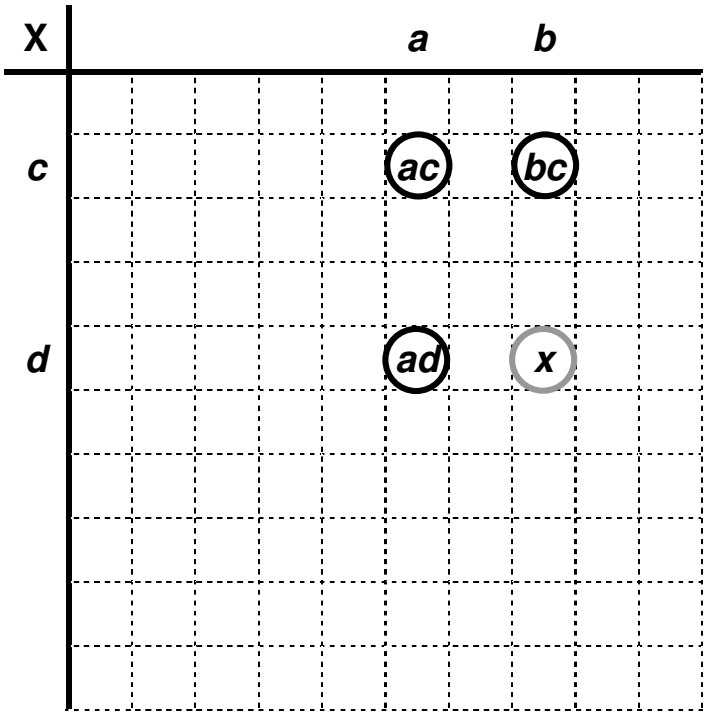
9) $\frac{15}{36}=\frac{x}{24}$

10) $\frac{9}{6}=\frac{21}{x}$

11) $\frac{12}{20}=\frac{3}{x}$

12) $\frac{15}{20}=\frac{x}{8}$

Solving Proportions,
An Algebraic Proof:



Given that three numbers in a proportion can be located on a multiplication table as the vertices of a rectangle, prove that the fourth vertex is the solution to the proportion.

If x is the solution to the proportion, then,

$$\frac{ac}{ad} = \frac{bc}{x}$$

$x = bd$	Given
$\frac{ac}{ad} = \frac{bc}{bd}$	Substitution
$(ac)(bd) = (ad)(bc)$	Cross products
$(abcd) = (abcd)$	Associative property

Exploring Quadratic Functions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Looking at numbers in the diagonals of the multiplication table allows us to explore quadratic functions. Here we see the square numbers which are generated of course by multiplying a factor in the left column by its matching factor in the top row.

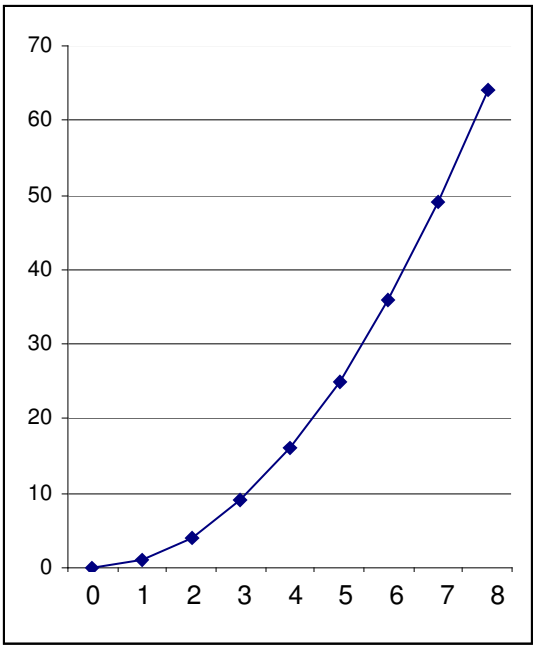
These functions are of the form:

$$y = ax^2 + bx + c$$

We can view the circled numbers and the numbers to their far left as the columns of a t-table.

When graphed they always form parabolas as shown. But what about other diagonals in the multiplication table?

x	y
1	1
2	4
3	9
4	16
5	25
6	36



Exploring Quadratic Functions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Here we look at the next diagonal to the right. These are not square numbers, but they still represent a quadratic function.

Notice that the numbers can be represented as their products as shown in the t-table. We see that each number is the product of the step (x) and one more than the step ($x + 1$):

Thus we can represent the function as:

$$y = x(x + 1)$$

or

$$y = x^2 + x$$

x	y	
1	2	= 1 x 2
2	6	= 2 x 3
3	12	= 3 x 4
4	20	= 4 x 5
5	30	= 5 x 6
6	42	= 6 x 7

Exploring Quadratic Functions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

x	y	
1	3	= 1 x 3
2	8	= 2 x 4
3	15	= 3 x 5
4	24	= 4 x 6
5	35	= 5 x 7
6	48	= 6 x 8

Here is the next diagonal in the chart. Again the numbers can be represented as their products in the t-table.

Now each number is the product of the step (x) and *two* more than the step ($x + 2$):

Thus we can represent the function as:

$$y = x(x + 2)$$

or

$$y = x^2 + 2x$$

This pattern continues throughout the chart creating the following sequence of functions:

$$y = x^2 + 3x$$

$$y = x^2 + 4x$$

$$y = x^2 + 5x$$

If the diagonal is moved to the left of the square numbers we get functions of this nature:

$$y = x^2 - x$$

$$y = x^2 - 2x$$

$$y = x^2 - 3x$$

Exploring Quadratic Functions:

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

What if we flip the diagonal? Now we get a new arrangement of numbers.

Now each number is the product of the step (x) and eleven minus the step ($11 - x$):

Thus we can represent the function as:

$$y = x(11 - x)$$

or

$$y = 11x - x^2$$

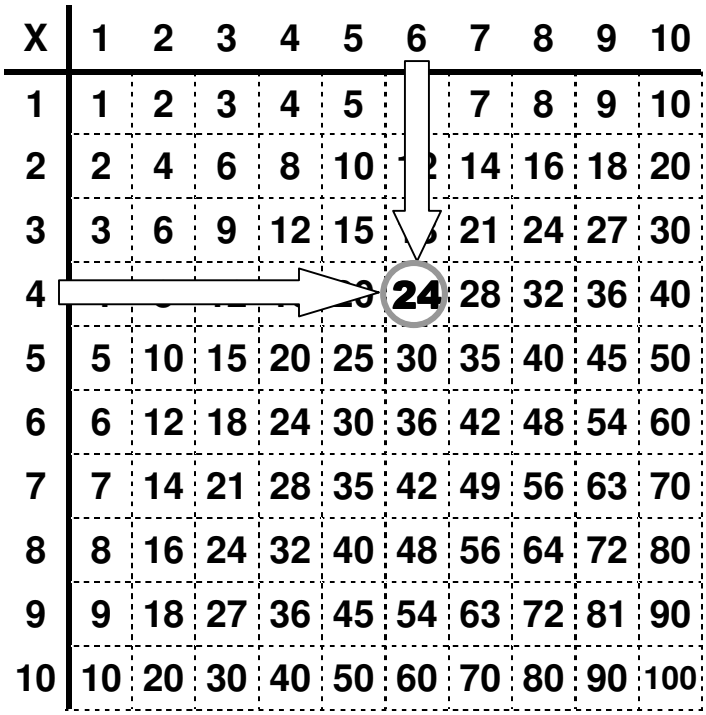
Put in standard form, the equation is:

$$y = -x^2 + 11x$$

Students can now explore quadratic functions that can be found in other diagonals of the multiplication table.

x	y	
1	10	$= 1 \times (11 - 1)$
2	18	$= 2 \times (11 - 2)$
3	24	$= 3 \times (11 - 3)$
4	28	$= 4 \times (11 - 4)$
5	30	$= 5 \times (11 - 5)$
6	30	$= 6 \times (11 - 6)$

And Finally:



X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5		7	8	9	10
2	2	4	6	8	10		14	16	18	20
3	3	6	9	12	15		21	24	27	30
4						24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Let's not forget that the multiplication table is pretty handy for multiplying numbers too!

While we want to help students to be independent from relying on a multiplication table, allowing them time to explore the mathematics hidden in this simple chart will not only make them more familiar with its members and its properties, it will help them enjoy the intricate beauty of the mathematics it reveals.

And who knows what jewels your students may discover buried here!

"The real voyage of discovery consists not in seeking new lands but seeing with new eyes."

Marcel Proust

"Symbolic knowledge that is not based on understanding is "highly dependent on memory and subject to deterioration."

T. E. Kieren,

All nature is but art unknown to thee,
All chance, direction, that thou cannot see.

Alexander Pope

"Out of nothing I have created a strange new universe."

János Bolyai

"The imagination in a mathematician who creates makes no less difference than in a poet who invents . . ."

Jean Le Rond D'Alembert

"Our biggest failure is our failure to see patterns."

Marilyn Ferguson

"Many dormant minds have been aroused into activity through the mastery of a single problem."

Benjamin Franklin Finkel

"It's like asking why Beethoven's Ninth Symphony is beautiful. If you don't see why, someone can't tell you. I *know* numbers are beautiful. If they aren't beautiful, nothing is."

Paul Erdös, Hungarian mathematician

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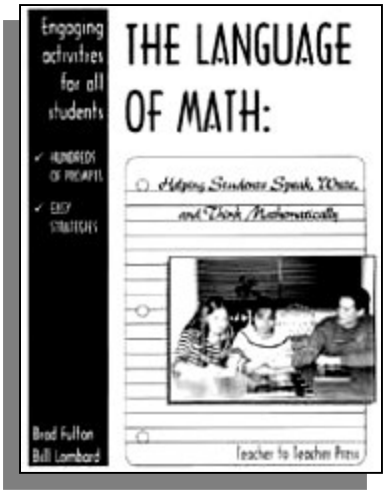
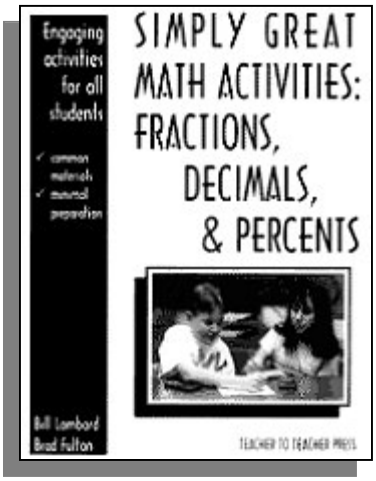
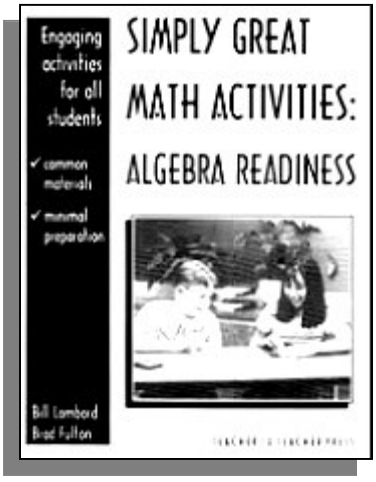
Books by Brad and Bill



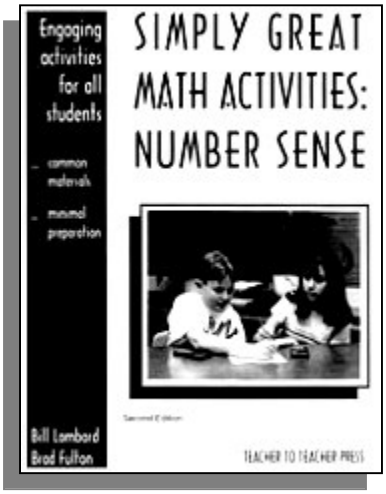
The Language of Math helps teachers create a classroom environment rich in mathematical thinking by showing them how to easily incorporate oral and written language into their math classes. Over 100 journal and discussion starters are included along with extensive instructions for making the most of your math time.



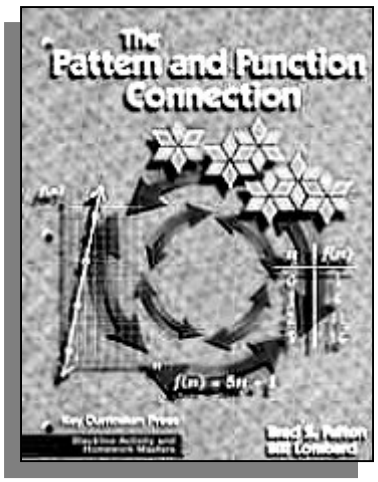
Here are a dozen unique and conceptual activities that will help your students add, subtract, multiply and divide fractions as well as connect them to decimal and percent representations. Both you and your students will love the novel and creative approach.



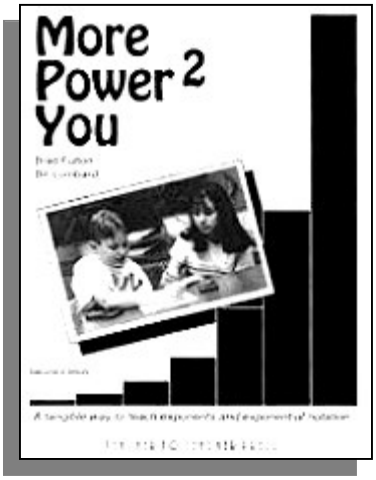
Teachers are raving about how effective these activities have been in their classrooms. Children as young as fourth grade and college students alike say that algebra is easy and makes sense because of this incredible approach.



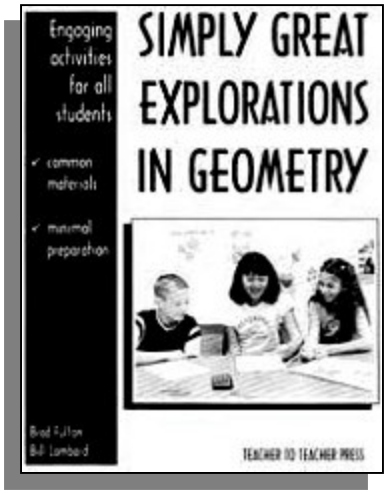
Students don't even think they are doing math sometimes because these activities are so fun and engaging, but they are developing rich and valuable number sense as they explore these eleven creative activities.



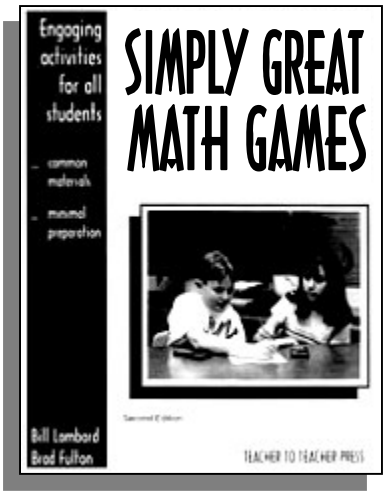
Our first book is still one of our most popular. Every teacher we talk to who has tried this approach to functions has been amazed at what their students have learned and accomplished. Over 150 pages of multiple representations of functions cover such concepts as slope, intercept, and function notation. Even elementary students have developed an understanding of functions with this book.



Exponents will finally make sense to your students after they participate in the unique activities found in this book. Both positive and negative exponents are demonstrated conceptually. Your students will even be able to explain *why* $n^0 = 1$.



Over one dozen geometry activities will excite your students as they discover the connections between geometry and fractions, decimals, percents, and even algebra. Area formulas, angle measurement, polygon attributes, vocabulary, and construction are covered.



A dozen engaging and educational games await you and your students in this creative and highly adaptable book. You'll find games that reinforce basic operations with whole numbers, fractions, decimals, and integers as well as algebraic skills. Game masters will serve a spectrum of grade levels and skill levels. Your students will beg for more!

Download *free* sample chapters at our website:

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